PATENT ABSTRACTS OF JAPAN

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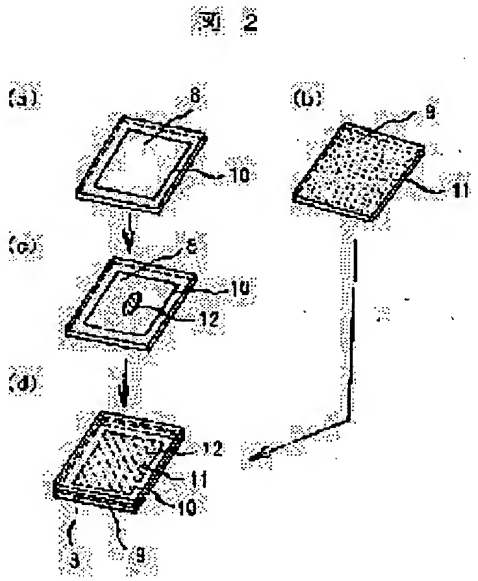
(54) LIQUID CRYSTAL DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a new liquid crystal display device of high reliability having preferable alignment characteristics of the liquid crystal, which is manufactured by using a photosetting resin composition as a sealing material, taking little time for injection of the liquid crystal, suppressing misalignment of the two substrates or gap fluctuation to extremely small, without causing contamination of the liquid crystal or intrusion of dust and without damaging alignment layers on the electrode substrates and a method of manufacturing the device.

SOLUTION: A photosetting sealing material is applied on at least one of two electrode substrates with alignment layers facing each other, and spacers are scattered on and fixed to one of the electrode substrates. Then, the liquid crystal in a required amount is dropped onto the electrode substrate where the sealing material is applied and the two electrode substrates are stacked one on another under vacuum. Then, the sealing material is irradiated with a light of ≥350 nm wavelength under normal pressure to stick together the substrates.



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CLAIMS

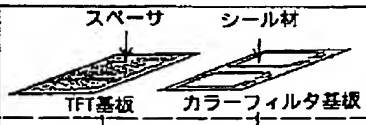
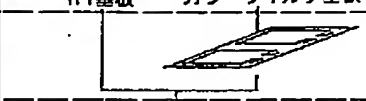
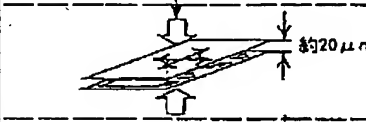
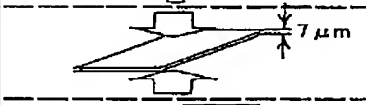
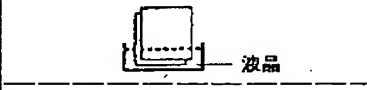
[Claim(s)]
[Claim 1] The liquid crystal display characterized by irradiating light with a wavelength of 350nm or more, and sticking on a sealant by ordinary pressure after carrying out initial-complement dropping of the liquid crystal and laying two above-mentioned electrode substrates on top of the electrode substrate which has arranged the photoresist sealant at least to one side of two electrode substrates with the orientation film which counter, and has arranged the sealant after sprinkling the spacer to one of electrode substrates and making it fix to them in a vacuum.
[Claim 2] The manufacture approach of the liquid crystal display according to claim 1 characterized by for the viscosity of 25 degrees C applying the radical polymerization mold photo-setting resin constituent of 40 - 100 Pa-s, irradiating light with a wavelength of 350nm - 780nm as the light source as a sealant, and stiffening a sealant.
[Claim 3] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying an acrylic photo-setting resin constituent, carrying out optical cutoff of the orientation film surface by mask material as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 4] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying an acrylic photo-setting resin constituent, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass as a radical polymerization mold photo-setting resin constituent which is a sealant, and carrying out photo-curing of the sealant.
[Claim 5] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying an en / thiol system photo-setting resin constituent, carrying out optical cutoff of the orientation film surface by mask material as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 6] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying an en / thiol system photo-setting resin constituent, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass as a radical polymerization mold photo-setting resin constituent which is a sealant, and carrying out photo-curing of the sealant.
[Claim 7] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying acrylic, and an en / thiol system mixing photo-setting resin constituent, carrying out optical cutoff of the orientation film surface by mask material as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 8] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying acrylic, and an en / thiol system mixing photo-setting resin constituent, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass as a radical polymerization mold photo-setting resin constituent which is a sealant, and carrying out photo-curing of the sealant.
[Claim 9] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the acrylic photo-setting resin constituent which blended the adhesion promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, carrying out optical cutoff of the orientation film surface by mask material, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 10] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the acrylic photo-setting resin constituent which blended the adhesion

promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass, and carrying out photo-curing of the sealant.
[Claim 11] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the en / thiol system photo-setting resin constituent which blended the adhesion promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, carrying out optical cutoff of the orientation film surface by mask material, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 12] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the en / thiol system photo-setting resin constituent which blended the adhesion promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass, and carrying out photo-curing of the sealant.
[Claim 13] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the acrylic, and the en / thiol system mixing photo-setting resin constituent which blended the adhesion promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, carrying out optical cutoff of the orientation film surface by mask material, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 14] The manufacture approach of the liquid crystal display according to claim 2 characterized by applying the acrylic, and the en / thiol system mixing photo-setting resin constituent which blended the adhesion promoter as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass, and carrying out photo-curing of the sealant.
[Claim 15] The liquid crystal display according to claim 1 characterized by attaching the thin film transistor (TFT) and the color filter to one side, and another side having the transparence electric conduction film in two electrode substrates with the orientation film which counter.
[Claim 16] The manufacture approach of the liquid crystal display according to claim 15 characterized by for the viscosity of 25 degrees C applying the radical polymerization mold photo-setting resin constituent of 40 - 100 Pa-s, irradiating light with a wavelength of 350nm - 780nm as the light source as a sealant, and stiffening a sealant.
[Claim 17] The manufacture approach of the liquid crystal display according to claim 15 characterized by applying an acrylic photo-setting resin constituent, carrying out optical cutoff of the orientation film surface by mask material as a radical polymerization mold photo-setting resin constituent which is a sealant, irradiating ultraviolet radiation and carrying out photo-curing of the sealant.
[Claim 18] The manufacture approach of the liquid crystal display according to claim 15 characterized by applying an acrylic photo-setting resin constituent, irradiating the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass as a radical polymerization mold photo-setting resin constituent which is a sealant, and carrying out photo-curing of the sealant.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the liquid crystal display used as a thin shape, a light weight, and a low-power display, and its manufacture approach.
[0002]
[Description of the Prior Art] In recent years, as a thin shape, a light weight, and a low-power display, the liquid crystal display is used in every direction, and is in the situation whose availability will increase further from now on.
[0003] From the former, manufacture of a liquid crystal display is the process which used the heat-curing mold sealant of Table 1, and requires long duration.
[0004]
[Table 1]

表 1

工程		熱硬化型	光硬化型	
スペーサ散布 シール材塗布		——	——	——
溶媒乾燥		10分 (120℃)		
アライメント		2分 (80℃)	5分 (RT-光照射)	5分 RT・光照射 液晶共存
ギャップ出し		1.0h 90～100℃		
シール材加熱硬化		10h (90～190℃)	——	——
液晶注入		4h (RT)		——
封入口封止		4h (RT)		——

RT：25℃

[0005] The attempt which it is going to improve at the short-time process using current and the photo-curing mold sealant of Table 1 is just going to be made. The short-time process closed under liquid crystal coexistence using a photo-curing mold sealant is expected to be especially shown in the right of Table 1.

[0006] As an approach of manufacturing a liquid crystal display, the following approaches are proposed from the former.

[0007] (1) As shown in drawing 1 (a) and (b), it is in the condition which pressurized two electrode substrates 2 with the orientation film with which the orientation film 1 (polyimide of the quality of the material is in use) stuck to the maximum inside, and which counter. In the container made by hardening the heat-curing mold epoxy system sealant 4, and carrying out adhesion immobilization, maintaining fixed spacing with a spacer 3 The approach pour in liquid crystal 5 by the vacuum or pressurization through the liquid crystal inlet 6 in which it was beforehand prepared by the seal section, and liquid crystal 5 closes the liquid crystal inlet 6 using the sealing agent 7 which consists of a heat-curing mold epoxy resin or ultraviolet curing mold acrylic resin so that there may be no leakage appearance.

[0008] (2) The approach are using an ultraviolet curing mold epoxy resin or ultraviolet curing mold acrylic resin as a sealant 4, and using [on the above (1) and] ultraviolet curing mold acrylic resin as a sealing agent 7.

[0009] (3) Drawing 2 (a) How to carry out constant-rate dropping of the liquid crystal 12, and stick [arranges a sealant 10 at least at one of the two of two electrode substrates 8 and 9 with the orientation film which counter as shown in - (d), and] two electrode substrates 8 and 9 on the electrode substrate 8 in a vacuum.

[0010] (4) Drawing 3 (a) How to arrange the sealant 16 which prepared the liquid crystal exhaust port 15 beforehand for at least one of the two of two electrode substrates 13 and 14 with the orientation film which counter as shown in - (e), trickle liquid crystal 18 more than an initial complement on the electrode substrate 13, discharge,lamination and excessive liquid crystal for two above-mentioned electrode substrates in a vacuum, and close the liquid crystal exhaust port 15 using a sealing agent 19.

[0011]

[Problem(s) to be Solved by the Invention] However, by the above (1) and the approach of (2), in order that an inlet may contact liquid crystal, it is easy to generate a trouble in a display panel by liquid crystal contamination or dust mixing. Moreover, there is a fault which liquid crystal impregnation takes long duration.

[0012] Moreover, although the above (1) and the measures of the technical problem of the approach of (2) are enough taken by the above (3) and the approach of (4) as shown in JP,62-89025,A and JP,6-235925,A, about a sealant, reference is hardly made. As a sealant, ultraviolet curing mold resin is effective compared with the point which improves a location gap and gap variation of the productivity of a liquid crystal display, and two substrates to heat-curing mold resin.
[0013] however, the viscosity of 25 degrees C of a sealant is too low, even if it uses which sealant, a sealant flows to a liquid crystal side and the target display screen is not obtained, or If the big technical problem that the viscosity of 25 degrees C is too high, and gap **** becomes inadequate occurs and ultraviolet curing mold resin is further used as a sealant The orientation film on the electrode substrate of the liquid crystal display which received the exposure of ultraviolet radiation at the time of hardening received damage, and the big technical problem that the orientation property of liquid crystal was spoiled occurred.
[0014] this invention be make that a technical problem which be mentioned above should be solve , and do not require time amount for impregnation of liquid crystal , but its location gap and gap variation of two substrates be very small , and it do not have neither liquid crystal contamination nor dust mixing , and the display screen and its gap **** be enough , and it aim at offer a high-reliability liquid crystal display with the good and new orientation property of liquid crystal made without do damage to the orientation film on an electrode substrate , and its manufacture approach .
[0015]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of this invention persons' repeating examination wholeheartedly, as shown in drawing 2 [of the above (3)] (a) - (d) A sealant 10 is arranged at least at one of the two of two electrode substrates 8 and 9 with the orientation film which counter. When carrying out initial-complement dropping of the liquid crystal 12 and sticking two electrode substrates 8 and 9 on the electrode substrate 8 in a vacuum The viscosity of 25 degrees C uses the acrylic photo-setting resin constituent of a radical polymerization mold, and/or an en / thiol system photo-setting resin constituent by 40 - 100 Pa-s as a sealant 10. Light with a wavelength of 350nm - 780nm was irradiated, or the liquid crystal display which fills the above-mentioned technical problem by irradiating the ultraviolet radiation which carries out optical cutoff of the orientation film surface by mask material, and does not carry out a wavelength limit, hardening, and carrying out adhesion immobilization was obtained, and this invention was reached.
[0016] In order to raise the adhesive property between the electrode substrates 8 and 9 with the orientation film, it can attain by arranging an adhesion promoter to the above-mentioned constituent which is a sealant 10.
[0017] As the light source used by this invention, the mercury lamp which generates the light and ultraviolet radiation with a wavelength of 780nm or less so much, a xenon lamp, a metal halide lamp, etc. are useful. The beam of light generated from these light sources heats a liquid crystal display component beyond the need, or has a possibility of carrying out photodegradation of the liquid crystal.
[0018] In the case of the photo-curing of the above-mentioned constituent, it devises so that a beam of light may shine only upon a constituent. Generally irradiation time is 0.1 - 5 minutes. That is, if shorter than 0.1 minutes, a photoresist will become inadequate, an adhesive property is inferior, and it will become unproductive and inconvenient if longer than 5 minutes.
[0019] Here, by short wave Nagamitsu 350nm or less, the orientation film receives [the wavelength of the light from the above-mentioned light source] damage, and with long wavelength light 780nm or more, since a hardening reaction is slow and unproductive, the light whose wavelength is 350nm - 780nm is good.
[0020] As the exposure approach, the ultraviolet radiation which let the cut-off filter (thing for intercepting light with a wavelength of 350nm or less) pass is irradiated. In addition, when carrying out optical cutoff by mask material, such as a metal plate which painted the orientation film surface on an electrode substrate black, stiffening the above-mentioned constituent and carrying out adhesion immobilization of the two above-mentioned electrode substrates with the orientation film, it does not let a cut-off filter pass, but ultraviolet radiation can be used directly.
[0021] Moreover, a sealant is arranged to either [at least] two electrode substrates with the orientation film which counter, i.e., a thin film transistor, (TFT), a substrate with a color filter or a substrate with the transparence electric conduction film, after sprinkling a spacer to one of electrode substrates and making it fix to them, initial-complement dropping of the liquid crystal is

carried out, two above-mentioned electrode substrates are stuck on the electrode substrate which has arranged the sealant in a vacuum, and a liquid crystal display can also be made.

[0022] Moreover, the viscosity of 25 degrees C used as a sealant by this invention adds adhesion promoters (silane system coupling agent etc.), a bulking agent, etc. to this for the purpose of property amelioration if needed on the basis of that from which the acrylic photo-setting resin constituent of a radical polymerization mold added the photosensitizer to acrylic (meta) resin by 40 - 100 Pa-s.

[0023] If a sealant will flow to a liquid crystal side, the target display screen will not be obtained, if the viscosity in 25 degrees C of the above-mentioned sealant is lower than 40 Pa-s, but the viscosity of 25 degrees C is higher than 100 Pa-s, since display unevenness occurs, the sealant of 40 - 100 Pa-s has the viscosity of 25 degrees C effective [gap **** is inadequate, and] (however, viscosity in 25 degrees C of liquid crystal 0.001 - 0.1 Pa-s).

[0024] (Meta) If acrylic resin is hardened at high speed according to a radical polymerization including one or more acrylic (meta) radicals in 1 molecule, there is especially no limitation.

[0025] However, in order to improve dampproofing, an adhesive property, non-compatibility with liquid crystal, etc., the molecule frame of acrylic (meta) resin has polyester, a polyether, a hydrocarbon, good silicone, etc.

[0026] (Meta) As acrylic resin, there are di(meth)acrylate, such as what attached the acrylic (meta) radical to the both ends of a molecule frame, for example, an adipic acid and the polyester obtained from ethylene glycol, a polyethylene glycol, bisphenol A diglycidyl ether, Pori 1, two butadienes, and poly dimethylsiloxane, hexane JIORUJI (meta) acrylate, ethylene GURIKORUJI (meta) acrylate, butane JIORUJI (meta) acrylate, etc.

[0027] Moreover, the acrylic compound which contains one acrylic (meta) radical in 1 molecule (meta), for example, 2-ethylhexyl (meta) acrylate, 2-hydroxypropyl (meta) acrylate, lauryl (meta) acrylate, DESHIRU (meta) acrylate, benzyl (meta) acrylate, etc. may be used for the purpose of adjustment of a viscosity down and glass transition temperature. In addition, 2-hydroxyethyl (meta) acrylate may be used for the purpose of adhesive improvement.

[0028] Since the photosensitizer used by this invention is visible, if a photolysis or a hydrogen abstraction reaction is caused by the light of the wavelength of an ultraviolet region, it produces a radical and the radical polymerization by the acrylic (meta) radical is started, there will be especially no limitation.

[0029] As a photosensitizer, it is acetophenones, such as benzoin ether [, such as benzoin iso-propyl ether,], 2, and 2-diethoxy acetophenone, 1-hydro oxy-cyclohexyl phenyl ketone, and 2-hydro oxy-, for example. - Anthraquinone, such as xanthones, such as benzophenones, such as 2-methyl-1-phenyl propane-1-ON, a benzoin, and p-methoxybenzophenone, and a thioxan ton, m-chloroacetophenone, propiophenone, benzyl, and 2-methyl anthraquinone, benzyl dimethyl ketal, etc. are useful.

[0030] The amount of the photosensitizer used has desirable 0.01 - 5 weight section to the acrylic (meta) resin 100 weight section. When fewer than the 0.01 weight section, the photoresist of the above-mentioned acrylic resin constituent is inferior, and if [than 5 weight sections] more, an adhesive property will fall.

[0031] As an adhesion promoter, the adhesion property of the resin constituent concerning this invention is improved, and there is a graft copolymer with the rubber, such as other polychloroprenes, Pori 1, four butadienes, a styrene butadiene copolymer, an acrylonitrile styrene butadiene copolymer, and ethylene propylene system rubber, and the acrylic (meta) resin which are a silane system coupling agent, a titanium system coupling agent, etc. The amount of the adhesion promoter used has desirable 0.1 - 10 weight section to the acrylic (meta) resin 100 weight section. If fewer than the 0.1 weight section, an adhesion facilitatory effect will not fully show up. Moreover, if [than 10 weight sections] more, while the adhesion promoter of the surplus in the above-mentioned acrylic resin constituent will flow into a liquid crystal layer and having bad influences, such as the stacking tendency of liquid crystal, glass transition temperature is reduced.

[0032] In order to improve the spreading nature of the resin constituent concerning this invention, to adjust the viscosity of a constituent, the coefficient of thermal expansion of a hardened material, etc. and to prevent the solubility to liquid crystal, a silica, an alumina, a calcium carbonate, etc. can be used for a bulking agent. The amount of the bulking agent used has the desirable 5 - 100 weight section to the acrylic (meta) resin 100 weight section within limits with which the viscosity in 25 degrees C of a sealant fills 40-100Pa and s. If [than the 100 weight sections] more [effectiveness is inadequate if fewer than 5 weight sections, and], the adhesive property of the above-mentioned

acrylic resin constituent will fall.

[0033] Moreover, the en / thiol system photo-setting resin constituent used by this invention add adhesion promoters (silane system coupling agent etc.), a bulking agent, etc. to this for the purpose of property amelioration if needed on the basis of what added the photosensitizer to a polyene compound and the Pori thiol compounds.

[0034] If both harden a polyene compound at high speed according to a radical polymerization including two or more sulfhydryl groups (-SH) including two or more carbon-carbon partial saturation double bonds (C=C) in 1 molecule in 1 molecule also in the Pori thiol compounds, there is especially no limitation in both compound. As a polyene compound, a divinylbenzene, divinyl toluene, a triaryl SHIANU rate, Triallyl isocyanurate, tetra-ant ROKISHI ethane, trimethylol propane diaryl ether, The trimethylol propane triaryl ether, pentaerythritol diaryl ether, The pentaerythritol triaryl ether, the pentaerythritol tetra-allyl compound ether, The ethylene GURIKORUJI (meta) allyl compound ether, the propylene GURIKORUJI (meta) allyl compound ether, The butylene GURIKORUJI (meta) allyl compound ether, the polyethylene GURIKORUJI (meta) allyl compound ether, The polypropylene GURIKORUJI (meta) allyl compound ether, the polybutylene GURIKORUJI (meta) allyl compound ether, The JI (meta) allyl compound ether of the glycol which is a block or random copolymer of ethyleneoxide and propylene oxide, The JI (meta) allyl compound ether of the glycol which is a block or random copolymer of ethyleneoxide and a tetrahydrofuran, Although the JI (meta) allyl compound ether of bisphenol A, the JI (meta) allyl compound ether of ethyleneoxide (Pori) denaturation bisphenol A, the JI (meta) allyl compound ether of propylene (Pori) oxide denaturation bisphenol A, etc. are raised It is not limited to this. Moreover, two or more sorts of such mixture may be used.

[0035] Although the Pori thiol compounds which the sulfhydryl group of the superfluous above-mentioned Pori thiol compounds and the epoxy group of the following poly epoxide compounds were made to react as Pori thiol compounds besides diethylene glycol JIMERU captan, TORIGU recall JIMERU captan, tetra-glycol JIMERU captan, thiodiglycol JIMERU captan, CHIOTORI glycol JIMERU captan, a thio tetra-GURIKORUJI mercaptan, etc., and were obtained are raised, it is not limited to these. Moreover, two or more sorts of such mixture may be used.

[0036] As an example of a poly epoxide compound, bisphenol A mold epoxide, Ethylene glycol diglycidyl ether, polyethylene glycol diglycidyl ether, Propylene glycol diglycidyl ether, polypropylene glycol diglycidyl ether, Neopentyl glycol diglycidyl ether, 1, 6-hexanediol diglycidyl ether, Glycerol diglycidyl ether, glycerol triglycidyl ether, Although trimethylol propane diglycidyl ether, trimethylolpropane triglycidyl ether, diglycerol polyglycidyl ether, bisphenol smooth S form epoxide, bisphenol female mold epoxide, hydrogenation bisphenol A mold epoxide, etc. are raised It is not limited to these. Moreover, two or more sorts of such mixture may be used.

[0037] the blending ratio of coal of the polyene compound and the Pori thiol compounds which are used for this invention constituent -- the mole ratio of the sulfhydryl group of the carbon-carbon partial saturation double bond of a polyene, and the poly thiol -- being decided -- the ratio -- 1:1.5 to 1.5:1 -- it is -- desirable -- 1:1.2 to 1.2:1 -- it is about 1:1 most preferably. When the above of the blending ratio of coal of a polyene compound and the Pori thiol compounds is out of range, there is a nasty smell in it after hardening, or the degree of hardness of a hardened material falls too much, and when remarkable, the problem of not hardening may arise. The photosensitizer used by this invention is used for the above-mentioned acrylic photo-setting resin constituent, and it is easy to be desirable [the amount used / 0.01 - 5 weight section] to a total of 100 weight sections of a polyene compound and the Pori thiol compounds. When fewer than the 0.01 weight section, the photoresist of the above-mentioned en / thiol system photo-setting resin constituent is inferior, and if [than 5 weight sections] more, an adhesive property will fall.

[0038] what is used for the above-mentioned acrylic photo-setting resin constituent as an adhesion promoter which improves the adhesion property of a resin constituent -- being the same -- a silane system coupling agent, a titanium system coupling agent, etc. -- others -- there is a graft copolymer with rubber, such as polychloroprene, Pori 1, four butadienes, a styrene butadiene copolymer, an acrylonitrile styrene butadiene copolymer, and ethylene propylene system rubber, and acrylic (meta) resin etc. The amount of the adhesion promoter used has desirable 0.1 - 10 weight section to a total of 100 weight sections of a polyene compound and the Pori thiol compounds. If fewer than the 0.1 weight section, an adhesion facilitatory effect will not fully show up. Moreover, if [than 10 weight sections] more, while the adhesion promoter of the surplus in the above-mentioned en / thiol system resin constituent will flow into a liquid crystal layer and having a bad influence on the stacking tendency of liquid crystal etc., glass transition temperature is reduced.

[0039] The spreading nature of a resin constituent is improved, the viscosity of a constituent, the coefficient of thermal expansion of a hardened material, etc. are adjusted, and the bulking agent for preventing the solubility to liquid crystal is also the same as that of what is used for the above-mentioned acrylic photo-setting resin constituent, is good, and can use a silica, an alumina, a calcium carbonate, etc. The amount of the bulking agent used has the desirable 5 - 100 weight section to a total of 100 weight sections of a polyene compound and the Pori thiol compounds within limits with which the viscosity in 25 degrees C of a sealant fills 40-100Pa and s. If [than the 100 weight sections] more [effectiveness is inadequate if fewer than 5 weight sections, and], the adhesive property of the above-mentioned en / thiol system resin constituent will fall.

[0040] Furthermore, to the resin constituent of this invention, a defoaming agent, a leveling agent, polymerization inhibitor, etc. may be added if needed.

[0041] Hereafter, an example of the approach of making a liquid crystal display using the resin constituent of this invention is explained. Between two electrode substrates with the orientation film, as a sealant of the resin constituent of this invention, it applies on the field by the side of the orientation film of one of substrates so that it may become the pattern of the typeface of RO. The method of application may be applied using a dispenser, although screen printing is common.

[0042] The liquid crystal of a constant rate required for the typeface pattern center section of RO of a sealant spreading substrate is dropped.

[0043] Each orientation film surface is carried out inside for these two substrates, and the gap between substrates is adjusted to desired spacing, performing alignment through a spacer and returning to ordinary pressure in a vacuum.

[0044] Next, although it is the approach of this invention, after alignment and gap **** have finished, to the above-mentioned resin constituent, by irradiating the light of a predetermined wavelength field (350nm - 780nm), or carrying out optical cutoff only of the orientation film surface by mask material, and irradiating ultraviolet radiation, the above-mentioned resin constituent is stiffened, adhesion immobilization is carried out, two substrates are stuck, and a liquid crystal display is made.

[0045]

[Embodiment of the Invention] Hereafter, although this invention is explained to a detail based on an example, this invention is not limited to this.

[0046] The presentation of the photo-setting resin constituent of a sealant used for adhesion immobilization of two electrode substrates with the orientation film and presentation No. were shown in Table 2.

[0047]

[Table 2]

成分，粘度 ＼ 組成No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
（メタ）アクリル系樹脂	ポリ1，2－ブタジエンジメタアクリレート（分子量2000）	59	－	－	－	－	－	－	－	－	－	－	－	－	59	－
	ビスフェノールAジグリシジルエーテルのジアクリレート	－	19	10	10	15	40	－	－	－	－	－	－	10	－	10
	エチレングリコールジメタアクリレート	41	81	－	－	60	40	－	－	－	－	－	－	－	41	－
	ブタンジオールジアクリレート	－	－	90	76	－	－	－	－	－	－	－	－	90	－	90
	ラウリルメタアクリレート	－	－	－	14	－	－	－	－	－	－	－	－	－	－	－
	ベンジルメタアクリレート	－	－	－	－	25	－	－	－	－	－	－	－	－	－	－
	2－ヒドロキシエチルメタアクリレート	－	－	－	－	－	20	－	－	－	－	－	－	－	－	－
ポリエン	ビスフェノールAのジアリルエーテル	－	－	－	－	－	－	24	－	－	57	－	－	－	－	－
	エチレンオキサイドとテトラヒドロフランのランダムコポリマーのグリコールのジアリルエーテル（分子量1000）	－	－	－	－	－	－	－	50	－	－	81	－	－	－	－
	トリアリルイソシアヌレート	－	－	－	－	－	－	－	－	25	－	－	51	－	－	－
ポリチオール	ビスフェノールA型エポキシドと過剰トリグリコールジメルカプタンとの反応生成物であるポリチオール（分子量1000）	－	－	－	－	－	－	76	50	75	－	－	－	－	－	－
	テトラグリコールジメルカプタン	－	－	－	－	－	－	－	－	－	43	19	49	－	－	－
その他	ベンゾインイソプロピルエーテル（光増感剤）	3	2	1	1	1	2	1	1	1	1	1	1	1	3	1
	γ－メタグリロキシプロピルトリメトキシシラン（接着促進剤）	1	1	－	－	－	－	1	－	－	1	－	－	－	1	－
	シリカ（充填剤）の有無	有り	有り	有り	有り	有り	有り	有り	有り	有り	有り	有り	有り	無し	有り	有り
25℃における上記組成物の粘度（Pa・s）		40≦粘度≦100												40より小	100より大	40より小

*）組成は重量比を示す。

表 2

[0048] Here, as for an acrylic radical polymerization mold photo-setting resin constituent and presentation No.7-No.12, presentation No.1-No.6 show the constituent with which the viscosity which is 25 degrees C although it is an acrylic radical polymerization mold photo-setting resin constituent separates from the invention range, respectively, as for an en / thiol system radical polymerization mold photo-setting resin constituent, and presentation No.13-No.15. However, viscosity was measured with the rotational viscometer.

[0049] The above-mentioned resin constituent (sealant) is applied so that it may become the typeface pattern 10 of RO on one electrode substrate 8 with the orientation film using a dispenser, as shown in drawing 2 , and the liquid crystal 12 of an initial complement is dropped at a pattern center section. The bead-like spacer 11 of the diameter of 6.5 micrometer is sprinkled to the screen area on the electrode substrate 9 with the orientation film of another side.

[0050] Each orientation film surface is carried out inside for these two electrode substrates, alignment is performed through a spacer in a vacuum, and the gap between substrates is adjusted to desired spacing, returning to ordinary pressure.

[0051] Next, although it is the approach of this invention, after alignment and gap **** have finished, as shown in drawing 4 and drawing 5 , light was irradiated on condition that predetermined and sealants 22 and 29 were stiffened.

[0052] That is, drawing 4 carries out a wavelength limit, and irradiates the light from the light source 26 of a high pressure mercury vapor lamp, using colored-glass-filter UV-35 (Toshiba glass company make) as a cut-off filter 25 for intercepting light with a wavelength [of this invention] of 350nm or less, and how to carry out photo-curing of the above-mentioned resin constituent is shown. Moreover, drawing 5 is all irradiated without thickness's carrying out optical cutoff of the orientation film surface and carrying out the wavelength limit of the light from the light source 33 of a high pressure mercury vapor lamp as mask material 32 of this invention using the metal aluminum plate which is about 2mm and which was painted black, and how to carry out photo-curing of the above-mentioned resin constituent is shown.

[0053] About the liquid crystal display 35 which was stiffened as mentioned above and obtained, it observes visually whether the display screen is good as a property.

[0054] Next, the appraisal method of the orientation property by the polyimide system orientation film 34 of the liquid crystal display 35 obtained above was shown in drawing 6 .

[0055] That is, the polarization direction of two polarizing plates 39 is made to intersect perpendicularly mutually, a liquid crystal display 35 is inserted among them, one side is turned in

the direction of light 40, and it views by the eye 41 from another side.

[0056] When there is no orientation turbulence and light is visible to homogeneity, there is no damage in the orientation film 34 of a liquid crystal display 35, and it is shown that an orientation property is good.

[0057] On the other hand, when light is visible to an ununiformity, the orientation film 34 receives damage and it is shown that an orientation property is poor. The adhesive property was searched for as other properties. The existence of exfoliation of a sealant is observed visually and it is shown that that the liquid crystal display with which exfoliation is not seen has [fitness and exfoliation] an adhesive property visible to has a poor adhesive property.

[0058] In addition, both the orientation property of a liquid crystal display and the adhesive property performed not only the first stage but the reliability trial of an elevated-temperature shelf test (60 degrees C, 1000 hours) and a high-humidity/temperature trial (70 degrees C, 95%RH, 500 hours).

[0059] Using the photo-setting resin constituent (sealant) of a presentation of Table 2, hardening conditions were changed and the above-mentioned property of a liquid crystal display was examined. The result was shown in Table 3.

[0060]

[Table 3]

No. / 硬化条件，特性			実施例						比較例								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
硬化条件		樹脂組成No.	1－6	7－12	1－6	7－12	1－6	7－12	1－6	7－12	1－6	7－12	1－6	7－12	13	14	15
		カットフィルター	有り	有り	－	－	有り	有り	無し	無し	－	－	無し	無し	有り	有り	有り
		マスク材	－	－	有り	有り	－	－	－	－	無し	無し	－	－	－	－	－
	光照射条件	100mW/cm²×90s	→	－	→	－	－	－	→	－	→	－	－	－	→	→	→
		100mW/cm²×50s	－	→	－	→	－	－	－	→	－	→	－	－	－	－	－
		100mW/cm²×30s	－	－	－	－	→	→	－	－	－	－	→	→	－	－	－
特性		表示画面	○	○	○	○	○	○	○	○	○	○	○	○	×	×	×
	配向特性	初期	○	○	○	○	○	○	×	×	×	×	×	×	○	○	○
		高温放置後(60℃,1000h)	○	○	○	○	○	○	×	×	×	×	×	×	○	○	○
		高温高湿放置後(70℃, 95%RH,500h)	○	○	○	○	○	○	×	×	×	×	×	×	○	○	○
	被着性	初期	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		高温放置後(60℃,1000h)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		高温高湿放置後(70℃, 95%RH,500h)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

*) 光照射条件は波長365nm基準の値，sは秒を表す。
矢印記号→は左記の光照射条件を利用することを示す。
**) RHは相対湿度，hは時間を示す。
記号○は良好，×は不良を示す。

[0061] Here, that example No.1 shows six kinds of all liquid crystal displays that made separately six kinds of resin constituents to No.1-No.6 of Table 2 in those with cut-off filter and optical exposure condition 100 mW/cm2(wavelength of 365nm) x 90 seconds, and the property of example No.1 has become O in Table 3 shows that the properties of the six above-mentioned kinds of all liquid crystal displays are good.

[0062] From Table 3, example No.1-No.6 have the good display screen of a liquid crystal display, in order that the viscosity in 25 degrees C of the resin constituent in front of photo-curing may fill the invention range, and since there is the cut-off filter or mask material of this invention at the time of photo-curing, are not based on optical exposure conditions, but are understood that the orientation property of a liquid crystal display and an adhesive property are [the first stage and reliability-trial back] good.

[0063] On the other hand, although the display screen of a liquid crystal display is good in order that viscosity [in / in example No.of comparison7-No.12 / 25 degrees C of the resin constituent in front of photo-curing] may fill the invention range, and the adhesive property of a liquid crystal display is good in order for there to be both a cut-off filter of this invention and mask material at the time of photo-curing, it turns out that an orientation property is poor from the first stage.

[0064] Moreover, since there is a cut-off filter of this invention at the time of photo-curing, the first

stage and reliability-trial back has the orientation property of a liquid crystal display, and a good adhesive property, but since the viscosity in 25 degrees C of the resin constituent in front of photo-curing separates from the invention range, example No.of comparison13-No.15 are understood that the display screen of a liquid crystal display is faulty.

[0065] Furthermore, examination was advanced and it became clear that the first stage and reliability-trial back of all also of need properties, such as electrical properties other than the above, is [the liquid crystal display of example No.1-No.6 of Table 3] good.

[0066] Moreover, although the gap precision and location precision of a liquid crystal display are mu(6.5**0.5) m and 6.0 micrometers, respectively by the approach (conventional method) of drawing 1 which used the heat-curing mold epoxy system sealant, by the approach (example No.1-No.6 of Table 3) of this invention, it is mu(6.5**0.2) m and 2.0 micrometers, and it turns out that precision is improving, respectively.

[0067] Moreover, the liquid crystal display with which the electrode substrate with the orientation film with which the thin film transistor (TFT) and the color filter stick to one side, and the electrode substrate with the orientation film with which another side has the transparence electric conduction film counter an orientation film surface inside is the approach (example No.1-No.6 of Table 3) of this invention, and it became clear that light is irradiated and it can make from a transparence electric conduction film side.

[0068]

[Effect of the Invention] As explained above, the liquid crystal display of this invention did not require time amount for impregnation of liquid crystal, but a location gap and gap variation of two substrates were very small, and there was neither liquid crystal contamination nor dust mixing, it was made [this invention solved the fault of the conventional technique, and], without doing damage to the orientation film on an electrode substrate, and the orientation property of liquid crystal was also good. By applying this invention, it was cheap and manufacture of a highly reliable liquid crystal display was attained.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram of the liquid crystal display about invention conventionally.

[Drawing 2] It is the schematic diagram of the liquid crystal display concerning this invention.

[Drawing 3] It is the schematic diagram of the liquid crystal display about invention conventionally.

[Drawing 4] It is drawing showing the resin constituent hardening approach concerning this invention.

[Drawing 5] It is drawing showing the resin constituent hardening approach concerning this invention.

[Drawing 6] It is drawing showing the appraisal method of the orientation property of the liquid crystal display concerning this invention.

[Description of Notations]

1, 20, 27, 34 -- The orientation film, 2, 8, 9, 13, 14 -- An electrode substrate with the orientation film, 3, 11, 17, 23, 30, 37 -- A spacer, 4 -- Heat-curing mold epoxy system sealant, 5, 12, 18, 24, 31, 38 -- Liquid crystal, 6 -- 7 A liquid crystal inlet, 19 -- Sealing agent, 10, 16, 22, 29, 36 [-- 26 A cut-off filter 33 / -- The light source, 32 / -- Mask material, 39 / -- A polarizing plate (two sheets), 40 / -- Light (light etc.) 41 / -- Eye.] -- A sealant, 15 -- A liquid crystal exhaust port, 21, 28, 35 -- A liquid crystal display, 25